ALIEN SPECIES IN AMAMI OSHIMA ISLAND

In addition to the Small Indian mongoose, many other alien species (e.g., feral cats, feral goats, black rats and the Lanceleaf tickseed) have become established on Amami Oshima. Please be sure never to leave behind alien species in the wild nor let them escape.


Feral cat


Feral goat


Black rat


Lanceleaf tickseed

● Alien species of Amami Islands HP http://kyushu.env.go.jp/naha/wildlife/data/130902aa.pdf

We ask for your cooperation in activity of Amami Mongoose Busters

The Amami Mongoose Busters, which was formed in 2005, has continued its efforts to eradicate mongooses with the support of people in the island and researchers. We ask for your continued understanding and support of the mongoose control project as well as the Amami Mongoose Busters.

■ **Amami Mongoose Busters Blog**
http://amb.amamin.jp/

■ **Amami Mongoose Busters Facebook**
https://www.facebook.com/amamimongoosebusters

March 2014
Published by:

Naha Nature Conservation Office,
Ministry of the Environment, Japan
Okinawa Tsukansha Building 4F, 5-21 Yamashita-cho,
Naha-shi, Okinawa 900-0027

Amami Wildlife Conservation Center,
Ministry of the Environment, Japan
551 Koshinohata, Ongachi, Yamato-son, Oshima-gun,
Kagoshima 894-3104 TEL:+81-997-55-8620

Japan Wildlife Research Center,
Amami Ooshima Division (Amami Mongoose Busters)
1385-2 Naze, Uragami,Amami-City, Kagoshima 894-0008 TEL:+81-997-58-4013

Ministry of the Environment
Government of Japan

FOR ALL THE LIFE ON EARTH
Biodiversity

Edited by : Japan Wildlife Research Center
Design : artpost inc.
Photos : Mamoru Tsuneda, Teruho Abe, Yoshihito Goto, Kazuki Yamamuro, Ryuta Yoshihara, Japan Wildlife Research Center

The mongoose eradication project in Amami Oshima

Conservation of a precious ecosystem in Amami Oshima Island

Animals and plants in Amami Oshima Island

Owston's White-backed Woodpecker

Amami Oshima Island (Japanese name "Amami Oshima") is located in subtropical zone, and the island supports one of the largest laurel forests in Japan. Rich and diverse natural environments remain on the island which is surrounded by a beautiful ocean with coral reefs. The unique biodiversity of the Amami Oshima has developed because the island has been isolated from outside the areas for millions of years. As a reflection of its distinctive natural environmental history, many globally precious and endemic species such as the Amami rabbit evolved in the island. Many of ancestors of the native species migrated to Amami Oshima long years ago, when the island was connected to the Eurasian Continent. We must preserve the rich and diverse natural environment of Amami Oshima for future generations.

Amami rabbit

Pentalagus furnessi

This primitive rabbit is found only on Amami Oshima and Tokunoshima. The Amami rabbit stays in burrows in daytime, and leaves there at night to eat seedlings and acorns.

Ryukyu long-furred rat

Diplothrix legata

The largest rat in Japan, and endemic to Amami Oshima, Tokunoshima, and the northern part of Okinawa Island. It is arboreal, and mainly eats nuts and others on the trees.

Amami spiny rat

Tokudaia osimensis

This rat has spinous hair, and is found only on Amami Oshima.

Lidth's Jay

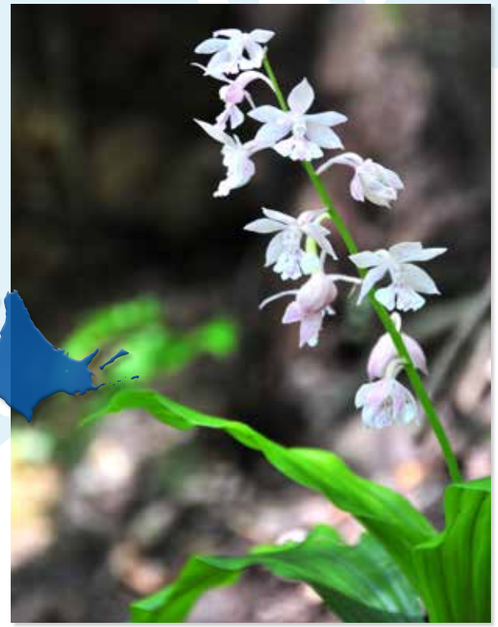
Garrulus lidthi

A beautiful bird with bright blue and brown in color. It is endemic to Amami Oshima, Kakeromajima, and Ukejima. It forages nuts and buries them.

Habu snake

Protobothrops flavoviridis

This poisonous snake is found on Amami Oshima, Tokunoshima, Okinawa Island, and other several neighboring small islands. It is nocturnal and preys mainly on small animals such as rats, small birds, lizards, and frogs.



Ryukyu ayu-fish

Plecoglossus altivelis ryukyuensis

An endemic freshwater fish to Amami Oshima and Okinawa Island. The fish became extinct on Okinawa Island, and was reintroduced into the island from Amami Oshima.

Amami calcanthe

Calanthe aristulifera var. *amamiana*

An orchid group plant, endemic to Amami Oshima. The population size of the plant has decreased due to overexploitation.

Amami Oshima Island

Area：712㎢
Highest elevation：
694m (Mt.Yuwan-dake)
Population：
About 68,600 people

Amami Ishikawa's frog

Odorrana splendida

A frog species of beautiful green color with gold spots. This frog is found only on Amami Oshima. Its call echoes throughout the mountain streams at night in breeding season.

A species of longicorn beetle

Rosalia ferriei

A long-horned beetle, endemic to Amami Oshima. Adults appear short period in summer. The beetle prefers old trees of such as chinquapins (*Castanopsis sieboldii*), and decrease of population size is concerned due to deforestation.

Amami & Ryukyu World Heritage

A candidate site for the World Natural Heritage site
-Amami and Ryukyu Islands-

In January 2013, Amami and Ryukyu Islands were officially nominated in UNESCO's provisional list of candidates for World Heritage sites by the World Heritage Convention Ministries and Agencies Liaison Committee of Japan. For listing of the Amami and Ryukyu Islands to the World Natural Heritage Site in the coming years, we engage in a variety of activities such as the establishment of a national park, the protection of rare species, and management of invasive species.

The mongoose eradication project is an essential work for restoration of the rich biodiversity in Amami Oshima, and for the listing of the area to the World Natural Heritage Site.

Biology of the small Indian mongoose

The small Indian mongooses were introduced and released into Amami Oshima in 1979 for control of habu snakes and rats. Mongooses have become invasive animal species and give damage to ecosystems throughout the world. In Japan, all mongoose species of Herpestidae family were designated as invasive alien species under the Invasive Alien Species Act in 2005.

Definition of invasive alien species in Alien Species Act

Individuals and their organs, stipulated under the Invasive Alien Species Act, have been brought to Japan from overseas and cause harm to ecosystems, people's lives, and the farming industry. Breeding, transporting, importing, and releasing of the invasive alien species are prohibited by the Act.

Why and when did the mongooses introduced to Japan?

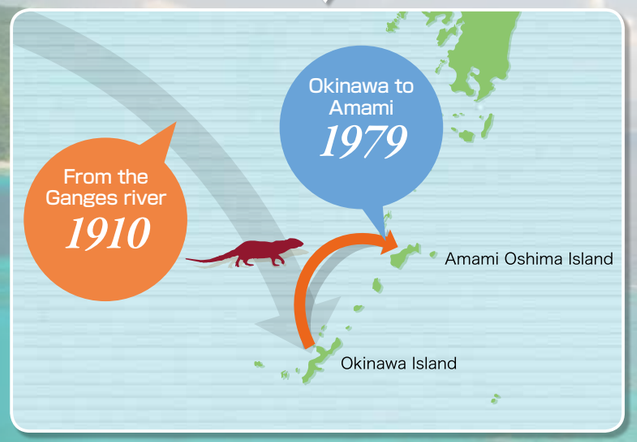
A habu snake eating a rat. Despite the introduction of mongooses, no significant decrease of the habu snake population has been observed in Amami Oshima.

The people of Amami Oshima and Okinawa have suffered from bitten damage by the poisonous habu snake. In 1910, Dr. Shozaburo Watase, a zoologist of Tokyo University, released mongooses in Okinawa Island in the hope that they would decrease the population of habu snakes and black rats (on which habu snakes prey). This effort, however, brought very little effect on decrease of the habu snake and rat populations. Nevertheless, mongooses were released on Amami Oshima in 1979.

Ecology of the small Indian mongoose *Herpestes auropunctatus* ※

Distribution

The small Indian mongoose (*Herpestes auropunctatus*) originally ranges from the Middle East to China. They were also released on the Hawaiian and Caribbean islands and have established populations in these islands. In Japan, it has been confirmed that the mongooses inhabit on Amami Oshima, Okinawa Island, and in parts of Kagoshima City.



Body size

Body length	Males : 60 cm
	Females : 50 cm
Weight	Males : 600 to 1,000 g
	Females : 400 to 600 g

※ Although the mongooses introduced to Amami Oshima were considered Javan mongooses (*Herpestes javanicus*), recent studies have shown that they are actually small Indian mongooses (*H. auropunctatus*).

Food

Insects, lizards, and rats are most important prey of mongooses. In addition, birds and small mammals are also predated by the animals.

Ecology

Reproduction :

Mongooses give birth once or twice a year in warm season, from April to September in Amami Oshima. Litter size is 1 to 5 (an average of 2.26). The young reach adult size in about 8 months after birth.

Life span :

On Amami Oshima, the average life span of mongooses is 1 to 2 years and the maximum life span is about 3 to 4 years.

Home range size :

The home range size of mongooses is 20 ha for adult males and 24 ha for females. They sometimes travel more than 2 km over a short period of time.

Introduction of the small Indian mongooses to Japan.

The mongooses occur now in Japan were caught in the estuarine area of the Ganges River and introduced to Okinawa Island in 1910, and then brought to Amami Oshima from Okinawa Island in 1979.

Yukari Handa and I investigating mongooses in 1990

Introduction of the mongooses degraded the forest ecosystem of Amami Oshima

I visited Amami Oshima for the first time in 1987, during my last summer vacation in college. I stayed for about a week, and I visited various places of the mountain and ocean areas in Amami Oshima and Kakeromajima. I was fascinated by Amami rabbits and Amami woodcocks that appeared one after another along the forest trails of Kinsakubaru at night trekking. I started living on Amami Oshima in the following spring after I graduated from college. I regularly visited the forest trails in Setouchi-cho and Sumiyo-cho, Amami City, where I encountered many Ryukyu spiny rats as well as Amami rabbits running along the trails. When I went to Kinsakubaru on a winter day with Mr. Takeichiro Minami, a habu snake catch specialist, a marvelous sound like birds chirping echoed through the forest trails at night. Mr. Minami told me that the animal sound is chorus of Amami Ishikawa's frogs. It was like a large choir, and it sounded like there were hundreds of frogs calling. I never expected that the animals in Kinsakubaru would disappear in a matter of a few years. The establishment and increase in the number of mongooses drastically have affected status of other animals in the forest.

Shintaro Abe (Naha Nature Conservation Office , Ministry of the Environment, Japan)

What is caused by the small Indian mongoose ?

Amami rabbit

Amami Ishikawa's frog

Problem 1 Introduction of the mongooses

Mongooses were brought into Amami Oshima to decrease habu snakes and black rats. However, because mongooses are diurnal and both habu snakes and black rats are nocturnal, the introduction of mongooses did not lead to a large number of predation on the snakes and the rats, and decreasing their populations. On the other hand, young Amami rabbits, which spend the daytime in their burrows, and the Amami woodcocks, which make their nest on the ground, became preferred prey animals of mongooses, and consequently their population sizes have decreased. The release of mongooses into the island with the hope that they would decrease the populations of habu snakes and black rats led to an unforeseen result: the decrease of the native species on Amami Oshima.

A mongoose invading in a Amami rabbit burrow

(photo by Fumio Yamada)

Mother checking her child in its burrow

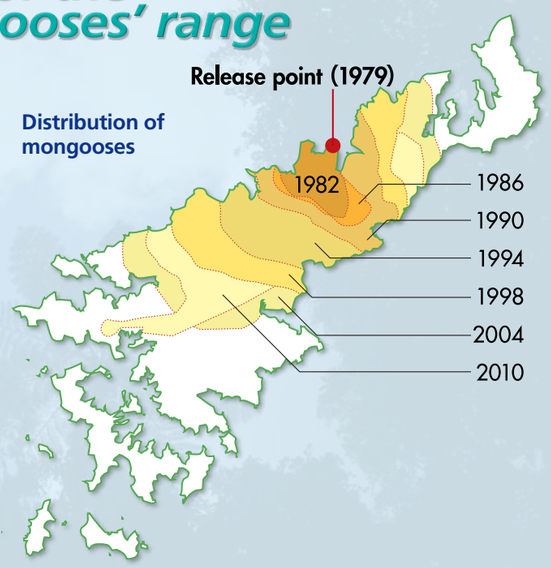
A mongoose come into the burrow

A mongoose left the burrow after two minutes later

Problem 2 Expansion of the mongooses' range

The mongooses released in central part of the island in 1979 gradually dispersed across a wide area in the island. By 2010, mongooses could be found in Uken village, which is located in the southwestern part of Amami Oshima. Thirty mongooses are said to have been released on Amami Oshima in 1979. It is estimated that the population of mongooses on the island increased to about 10,000 by the year 2000.

Distribution of mongooses



Problem 3 Threat to native species on Amami Oshima

From analyses of the stomach contents and fecal samples of mongooses, the remains of animals such as Amami rabbits and Ryukyu spiny rats were presented. It was also confirmed that mongooses ate amphibians such as Amami Ishikawa's frogs as well as reptiles such as Ryukyu tree lizards. The populations of such native species on Amami Oshima decreased as the mongoose population increased.

Animals predated by mongooses

A mongoose eating Ryukyu green snake

Amami rabbit fur in a mongoose feces
(photo by Fumio Yamada)

Amami spiny rat

Task Conservation of endemic species on Amami Oshima

The only way to protect the native species on Amami Oshima was to reduce the population size of mongooses by capturing them. In order to do this, community organizations and local governments began investigating the impact of mongooses to native animals, and also started capturing efforts.

Some species has increased by a decrease in the mongooses

Amami woodcock

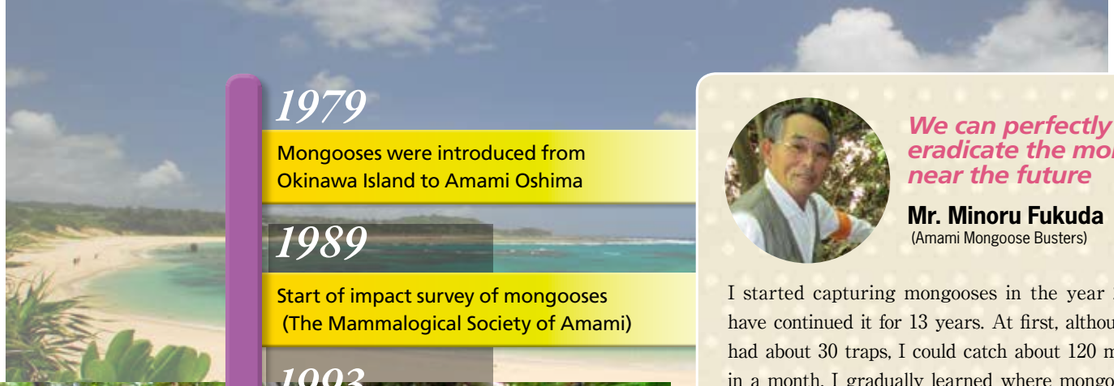
Amami tip-nosed frog

Checking a trap

Mongoose eradication project

Restoration of original ecosystem without mongoose

If things don't change, the animals on Amami Oshima will be gone. With the support of the people of the island who had such concerns, a full-scale mongoose eradication project was started in the year 2000. The mongoose eradication project based on the Invasive Alien Species Act was commenced on Amami Oshima in 2005. The goal of the project is to completely eradicate mongooses from Amami Oshima.



1979
Mongooses were introduced from Okinawa Island to Amami Oshima

1989
Start of impact survey of mongooses (The Mammalogical Society of Amami)

1993
Start of harmful wildlife control of mongooses (municipal governments)

1996
Start of monitoring and model eradication project of mongooses (Environmental agency and Kagoshima Prefecture)
Start of harmful wildlife control of mongooses (Kagoshima Prefecture)

2000
Start of eradication project

2003
End of harmful wildlife control of mongooses (Kagoshima Prefecture and municipal governments)

2005
Enforcement of the Invasive Alien Species Act
Start of eradication project of mongooses (Ministry of the Environment)
Amami Mongoose Busters is formed
Development of first action plan of Mongoose Eradication Project

2007
Introduction of detection dogs

2013
Development of second action plan of Mongoose Eradication Project

Future *2022*
Accomplishment of perfect eradication of mongooses

We can perfectly eradicate the mongooses near the future

Mr. Minoru Fukuda
(Amami Mongoose Busters)

I started capturing mongooses in the year 2000 and have continued it for 13 years. At first, although I only had about 30 traps, I could catch about 120 mongooses in a month. I gradually learned where mongooses tend to inhabit, and I was able to identify where they occur and catch them effectively.
But the mongoose population has decreased in recent years, and even I, a skilled mongoose catcher, have had difficulty catching them in large numbers. Nevertheless, I have continued to look for the places where mongooses might inhabit and tried to catch them. We will be able to completely eradicate mongooses if we continue such steady efforts.

We support the mongoose eradication project until perfect eradication of mongooses

Mr. Mikio Takashi
(The Amami Ornithologists's Club)

The Amami Ornithologists's Club has conducted monitoring of the Amami Thrush since 1994. When we first started the monitoring, we could only found about 50 birds, and we were concerned that the bird would go extinct. In 2013, however, we were able to count more than 500 Amami Thrush. The population of Amami woodcocks has also gradually increased. I believe that the decrease of the mongoose population has led to restore the population size of such birds.
Measures against mongooses on Amami Oshima have been continued through the hard work of the many people of the island and the Amami Mongoose Busters. In the future, let us all continue to support the Amami Mongoose Busters so that we could restore the wonderful wildlife of Amami Oshima as soon as possible.

Forests in Kinsakubaru is full of endemic species at one time

Mr. Mamoru Tsuneda
(Environmental Network Amami, Photographer)

I returned home town to Amami Oshima from Tokyo in 1980, which was soon after mongooses were released on Amami Oshima. When I returned the island, a lot of wildlife was observed in my homeland. In Kinsakubaru, I found many animals such as Amami rabbits, Amami Ishikawa's frogs, and Amami woodcocks, and I never got tired of observing them.
When I heard that mongooses had been released on the island, I immediately had the feeling that something terrible was about to happen. My initial feeling turned out to be correct, as the animals in Kinsakubaru gradually began to disappear. With a strong desire to protect the environment of Amami Oshima, I have continued to inform the importance of control of the mongooses.

I want to inform the damage by the mongooses to people in Amami Ohshima

Ms. Yukari Handa
(The Mammalogical Society of Amami)

In 1989, we established the Mammalogical Society of Amami and began investigating the impact of mongooses on ecosystems by analyzing the stomach contents of the mongooses trapped, and conducting questionnaire surveys. Every time precious animals were discovered in stomachs of mongooses, I recognized the horrific implications. I also felt that, because of spreading of damages by mongooses, capturing efforts by the people of the island alone were not enough for control, and an organization specialized in capturing mongooses was necessary for effective implication of the control program. Currently, the Amami Mongoose Busters is playing that role, and the busters is making good performance for decreasing the mongooses. I will support this activity until mongooses are completely eradicated.

Professionals to conserve the ecosystem on Amami Oshima

Amami Mongoose Busters!

The Amami Mongoose Busters was formed in 2005 with the aim of complete eradication of mongooses and restoring the native animals on Amami Oshima. It is an organization of professionals that strives to protect the wildlife of Amami Oshima. These professionals have the skills to capture mongooses, the power to climb mountains, the knowledge about wildlife, and are passionate about eradication of mongooses.

Traps for catching the mongooses

Catching by the traps

The most effective method of reducing the mongoose population is to catch them by traps. The Amami Mongoose Busters captures mongooses with live traps and weasel traps. Trapping sites now extend throughout the island, and roughly 30,000 traps have been set.

In recent years, the mongoose population has declined and not so many of them have been caught by the traps. In response to these situations, hair traps and sensor cameras are being used to find the occurrence areas of the mongooses remained. Efforts to catch mongooses are being continued using such equipments.


Live Trap


Weasel Trap


Hair Trap

Restoration of the native species to Amami Oshima Island

Monitoring of the native species

In order to monitor the restoration of native species as a result of the decline in the mongoose population, monitoring for the native animals are being carried out. The restoration of the animals has been verified through the use of sensor cameras that have been set up all over the island. The monitoring activities show gradual but steady expansion of their distribution and increase of population of the native animals such as Amami rabbits, Ryukyu spiny rats, and Amami woodcocks. For the Amami Mongoose Busters, observing the restoration of the populations of the native animals on Amami Oshima through daily activities enables the members to confirm the achievements of their eradication project for mongooses. They are proud of what they have achieved.

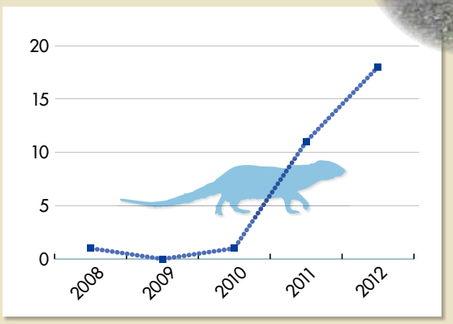
Pictures of a Ryukyu long-furred rat (left) and a mongoose (right) taken by sensor cameras.

An effective tool for search -ing the mongooses

Detection dogs

In order to catch mongooses more effectively, we are training detection dogs, which track down mongooses and find their burrows. The detection dogs go to the forests with handlers, and search for the scent of mongooses or their droppings. Sometimes, they can find the burrows where mongooses are hiding. Now that the mongoose population has decreased, detection dogs play a vital role in finding and catching mongooses, and there is a great deal of expectation regarding the successful use of these dogs to completely eradicate mongooses.

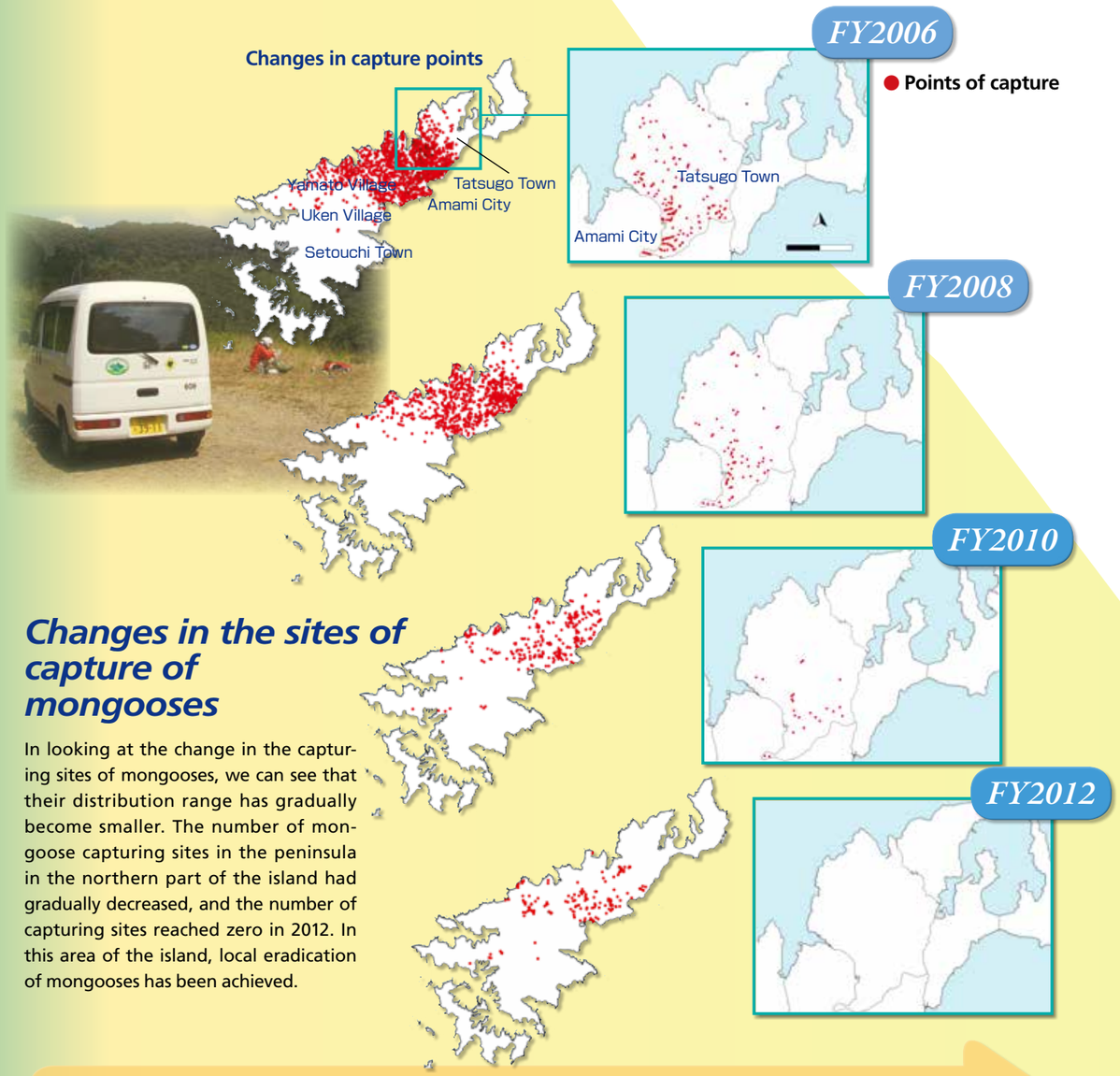
Number of captured mongooses by detection dogs



Perfect eradication of mongooses in the near future

The original habitat of the Small Indian mongooses introduced to Amami Oshima is South Asia. The mongooses were introduced to many places for controling rats and other animals, and have become established as an invasive species on many other islands (e.g., islands in the Caribbean and Hawaii). They have caused problems such as predation on native species, damage to farm production in many places introduced.

Only small islands with an area of less than 4 km^2 have been successful in complete eradication of the mongooses, and there are no islands of the size of Amami Oshima (712 km^2) that have been successful in complete removing mongooses in the world. If Amami Oshima is successful in complete eradication of mongooses, it will give a great deal of hope to people around the world who suffer from damage caused by mongooses. Although many challenges still remain, it appears that we are close to making our dream come true.



Changes in the sites of capture of mongooses

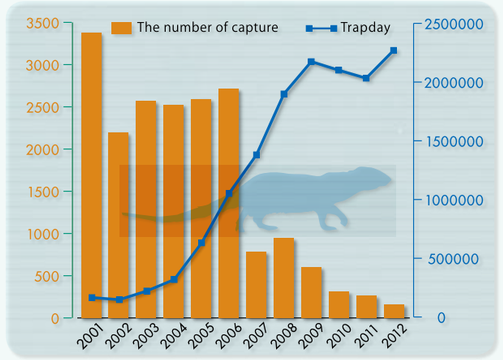
In looking at the change in the capturing sites of mongooses, we can see that their distribution range has gradually become smaller. The number of mongoose capturing sites in the peninsula in the northern part of the island had gradually decreased, and the number of capturing sites reached zero in 2012. In this area of the island, local eradication of mongooses has been achieved.

Distribution of mongooses have decreased !

Decreasing in mongoose population

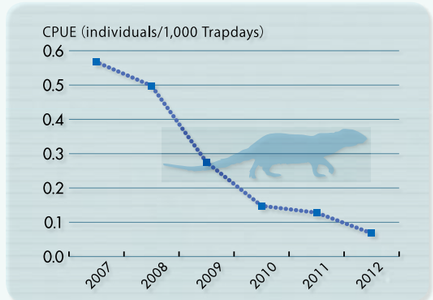
More than 32,000 mongooses have been captured on Amami Oshima by 2012. The number of traps has increased significantly since 2005, when the Amami Mongoose Busters started its activities. In contrast, the number of mongooses caught by the traps in a year has continued to decrease. CPUE (catch per unit effort) of each year indicate that density of mongooses has obviously decreased over the past few years of 2012.

Annual changes in the number of capture and effort



Since the Amami Mongoose Busters started its activities, there has been a drastic increase in the total number of traps (see the line graph). The total number of trap days has kept around 2 million every year since 2009. The number of mongooses caught (see the bar graph) has shown a declining trend since 2007, and been a significant drop in the number in recent years.

Annual changes in CPUE



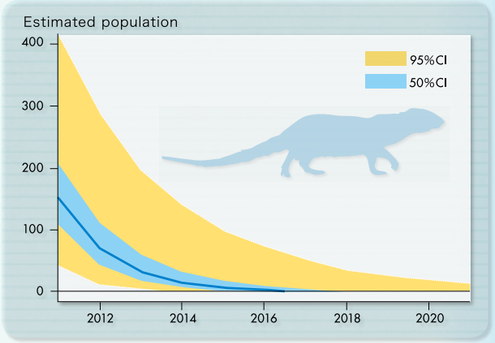
CPUE, an indicator of mongoose population size, has continued to decrease.

Mongooses have steadily decreased !

Can we eradicate mongooses perfectly in Amami Oshima Island ?

We estimate that the mongoose population size has decreased from 10,000 in the year 2000 to less than 300 in 2012. Based on the results of a computer simulation, it is expected that if mongooses continue to be captured at the current efficiency, the total population will be close to zero by around the year 2020. The smaller the mongoose population, the more difficult it will be to catch them. Therefore, things may not go as expected. However, the complete eradication of mongooses can be anticipated in the not-too-distant future.

Estimated population

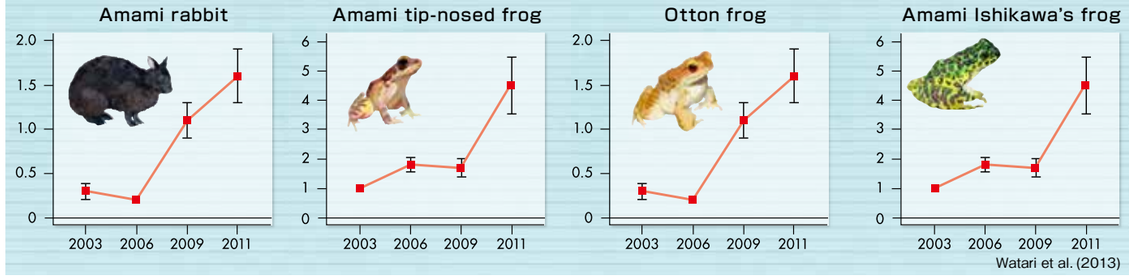


Perfect eradication can be accomplished !

No more *mongooses and healthy forest ecosystem*

Native species recovery as a result of decreasing the density of the mongooses

Many native animals in the forests of Amami Oshima have been restored in their original habitats. The graphs below show the results of a study on population indicators of 4 native animals on Amami Oshima, conducted by Dr. Yuya Watari (Japan Forest Technology Association) and others from 2003 to 2011. The study was conducted along a forest road which runs from north to south through the central area of the island. Every animal species including the Amami rabbit is increasing the indicator of population density. The mongoose eradication project on Amami Oshima by the Amami Mongoose Busters began in 2005. As the mongoose population has decreased, the populations of native animal species of Amami Oshima have increased. We are looking forward to seeing more native animals when we achieve the complete eradication of mongooses from the island.



These graphs show the number of animals observed while slowly driving along a 41.1 km long forest road at night. The vertical axis indicates the number of animals per one survey, and the horizontal axis indicates the year of studies.

Changes of the forest in Amami Oshima Island

Wildlife situation in the forest of Amami Oshima is changing in recent years through the mongoose eradication project. Amami spiny rats are being caught in live traps in large numbers; so many that it makes me shout with joy, "It's you again!" The areas where mongooses were caught in large numbers at one time are now covered with Amami rabbit droppings. These sights become common on the island since starting the eradication project. While the mongoose population is decreasing, number of cats and goats released into the wild and detected by the sensor cameras set up in the forest is increasing. The impact of these released animals to the ecosystems of Amami, if they establish wild populations, cannot be ignored. Humans are the principal cause of invasive species and feral animal problems. Whether these problems can be resolved depends on the will of each one of us.

Ryo Yamashita (Amami Mongoose Busters)

Second phase action plan of the eradication of the mongoose

First phase action plan of Mongoose Eradication Project for 10-years was formulated in 2005, and the eradication program of mongooses has been carried out. These efforts have enabled the island to reduce the population density of mongooses as well as to gather a great amount of relevant data. As a result, a road map toward the complete eradication of mongooses has become real possibility. In consideration of these achievements, the "Second phase action plan of Mongoose Eradication Project" was formulated in 2013. For complete eradication of mongoose from Amami Oshima by FY2022, the well-planned eradication project has been implemented by the Amami Mongoose Busters and relevant agencies.

Outline of the Action Plan

Goal

By conducting the activities based on the plan, we aim to completely eradication of mongooses from Amami Oshima in order to restore Amami Oshima's native species such as the Amami rabbit.

Eradication system

Led by the Amami Mongoose Busters, activities such as catching mongooses are carried out according to the plan. In addition, detection of mongooses remained is carried out using mongoose detection dogs trained.

Target ① We divide Amami Oshima into several management zones in the plan for eradication of mongooses from each management zone. We concentrate our effort for capturing the mongooses to the management zones located in northern part of the island in initial stage of the program. Then we expand the capturing efforts to other areas of the island after local elimination of the mongoose in the management zones. Through these processes, we aim to eliminate mongooses completely from Amami Oshima by FY2022.

Target ② Through technological development for mongoose control and monitoring, we also intend to improve the methods for catching mongooses.

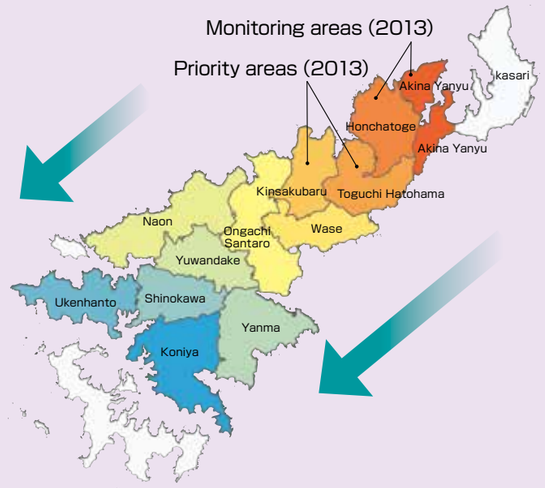
Target ③ Through monitoring of native species, we apply the necessary measures to eradicate mongooses.

Target ④ Through public awareness of the mongoose eradication project, we expect more public support for the project.

Target ⑤ Through regular evaluation of the implementation and achievement of the mongoose control program, we make any necessary improvements to achieve the project purpose.

Procedure for the complete mongoose eradication

① We divide Amami Oshima into 14 management zones. Size of one management zone is about 60 km^2.
② We select "priority zones" from the management zones in the northern part of island. We concentrate our mongoose catching efforts on these priority zones in the initial stage.
③ Zones where mongooses may no more remain are moved to "monitoring zones," and monitoring for confirmation of "zero mongooses area" is carried out in the zones.
④ When a priority zone are changed to a monitoring zone in the northern part of the island, a new priority zone is set up in the management zones in the southern part of there.
⑤ Zones before setting the next focus zones are classified as "low density zones," and efforts to catch mongooses are carried out.
⑥ Though these process, we attain eradication of mongooses in the northern part of the management zones at first, and finally eliminate them in the southern part of the management zones, it means complete eradication of the mongooses from the Amami Oshima.



Web page of The Second Phase Action Plan → http://kyushu.env.go.jp/naha/wildlife/data/gairai/boujyo/130425b.html